



DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
WATER QUALITY MONITORING AND ASSESSMENT SECTION
WATERSHED INFORMATION SHEET

James River Basin-11010002

Basin Description

The James River basin lies in southwestern Missouri and is composed of the James River and all its tributaries, the largest of which are Flat, Finley and Crane creeks. The James River flows in a southwesterly direction into Table Rock Lake.

The basin is 1,455 square miles in area. Sixty-three percent of this area is pasture and hayfields, 32 percent forest, three percent urban, 1 percent row crops and 1 percent water. The major portion of the City of Springfield is located in the northwestern part of the basin, and the James River in addition to wells, springs and reservoirs, is used as a source of drinking water supply for the city.

Average annual rainfall is 43 inches. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for the James River Basin

Stream/Location	Wtrshed. Area (sq.mi.)	Period Of Record	Flow (cfs)				
			90 th Percentile *	Mean	Median **	10 th Percentile ***	7Q10 Low Flow+
Pearson Cr. nr. Springfield	21	1999-2004	37	18.1	8.8	3.1	
James R. nr. Springfield	246	1955-2004	498	231	73	12	1
Wilson Cr. at Springfield	17.8	1932-1939 1973-1977 1998-2004	37	18.2	8.8	3.2	
Wilson Cr. nr. Springfield	31.4	1972-1982 1998-2004	45	20.7	6.1	0.0	
South Cr. nr. Springfield	10.5	1998-2004	7.2	6.6	0.0	0.0	
Wilson Cr. nr. Brookline	44.6	2001-2004	80	58.2	43	33	
Wilson Cr. nr. Battlefield	58.3	1968-1970 1972-1982 1999-2004	165	90.8	60	31	
James R. nr. Boaz	462	1972-1980 2001-2004	1,070	508	236	68	
Finley Cr. bl. Riverdale	261	2001-2004	433	210	90	24	
James R. at Galena	987	1921-2004	2,130	977	426	121	38
James R. below Battlefield	328	1929-32					5.4
Finley Cr. nr Ozark		1943,46,47, 1952,62-67					5.2

Flat Cr. at Cassville		1944-46,49 52,56,62-67					1.4
Flat Cr. at Jenkins		1942,62-67					10
Flat Cr. nr. Cape Fair		1969,70, 1972-74					11

*Flow is less than this amount 90 percent of the time

**Flow is less than this amount 50 percent of the time

***Flow is less than this amount 10 percent of the time

+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.

The surface of the basin is developed mainly in Mississippian age limestones. Some portions of the river valleys of the James River, Finley Creek and Flat Creek have incised the older Ordovician age dolomites. The surface geology is dominated by the Burlington limestone, which is highly weathered, and results in many areas of karst terrain including sinkholes, losing streams and springs. In these areas, surface water can rapidly infiltrate to shallow groundwaters and emerge elsewhere in the basin as a spring.

In areas such as the Springfield metro area, surface water pollutants such as petroleum products, bacteria, fertilizers, pesticides and other lawn care products, contaminate the shallow groundwater aquifer and local springs. This shallow aquifer developed within the weathered Mississippian age limestones is called the Springfield aquifer, and is separated from the deeper Ordovician age Ozark aquifer by an aquitard, the Northview shale. The Northview shale is generally effective in preventing contaminants in the Springfield aquifer from infiltrating to the deeper Ozark aquifer, which is used by the city as a drinking water supply. However there are locations where the Northview shale is absent or where faulting has allowed shallow groundwater to migrate downward into the Ozark aquifer. For this reason, reduction of pollutants in urban storm water is an important objective for the City of Springfield. An excellent description of karst features and several springs in the James River basin can be found in Springs of Missouri, Vineyard, 1982.

Water Quality of Missouri Springs

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-missouri-springs.pdf>

Water Quality Concerns

Acceptable water quality is defined by Missouri's Water Quality Standards

[<http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf>] . Streams or lakes that do not meet these standards are considered "impaired". They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are considered to be "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified

streams are small tributaries to classified streams. They typically have flowing water only during wet weather and are dry for the remainder of the year.

Point Source Pollution

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as “domestic wastewater.” It contains primarily treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

Wastewater Treatment

<http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf>

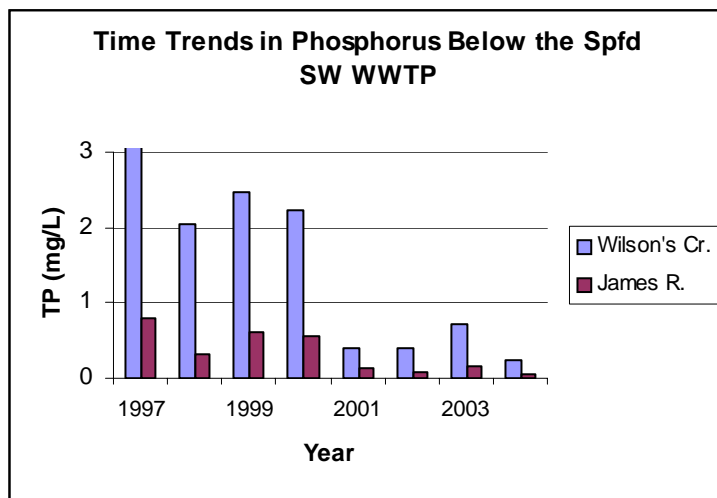
There are 55 permitted domestic or industrial/commercial point sources that discharge a combined 38.6 million gallons per day (mgd) of treated wastewater into the waters of the James River basin. There are 396 miles of classified streams in the basin, of which six miles (2 percent) are known to be affected or impaired by point source wastewater discharges. There are 3.2 miles of unclassified streams affected or impaired by point source wastewater discharges. The largest discharge in the basin is the 30.2 mgd discharge from the Springfield Southwest Wastewater Treatment Plant (WWTP). Discharges that affect or impair more than 0.5 miles of stream include the Springfield SW WWTP, and the Nixa and Reed Springs wwtps.

Because of concerns about increasing algal growth in both James River and Table Rock Lake, state regulations now put limits on the amount of phosphorus that can be discharged by most point source discharges in the James River basin. Since the Springfield SW WWTP discharge is about 78 percent of all wastewater discharged in the basin, this facility has taken a leadership role in phosphorus reduction. This facility has achieved a significant reduction in phosphorus in its wastewater and water quality monitoring has also shown significant phosphorus declines in both James River and upper James River arm of Table Rock Lake.

Springfield Southwest Wastewater Treatment Plant

http://www.ci.springfield.mo.us/egov/publicworks/sanitary/sw_plant.html

The graphic below shows average annual total phosphorus collected by the US Geological Survey on Wilson's Creek one-half mile below the Springfield SW WWTP and on James River about 14 miles downstream of the SW WWTP.



Nonpoint Source Pollution

The basin is predominantly forested and has very little cultivated land. Sheet erosion is estimated at 2.5-5 tons/acre/year and gully erosion at 0-0.16 tons/acre/year. Thus, there are no basin-wide nonpoint source problems. However, a 1990-92

study of groundwater in McDonald County showed that the Springfield aquifer in that area had elevated levels of nitrate and bacteria far above levels in the deeper Ozark aquifer that appeared to be related to livestock production. Given the more porous nature of the limestones in the Springfield area, groundwaters throughout the James River basin are judged to be highly susceptible to contamination by animal wastes and on-site home sewage treatment systems, typically septic tanks, in the expanding urban areas.

Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal manures, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program (319 program) that

provides funds to help defray the cost of adopting management practices. This program has funded three projects in the basin. State sales tax money dedicated to soil and water conservation has funded five watershed projects in the Goff and Dry Crane Creek watersheds.

Table 3. Nonpoint Source Watershed Projects in the James River Basin

Watershed Name	County	Project Date	Acres Treated	Percent of Watershed Treated
James R. Watershed-319		2001-06		
Pearson Cr. Urban Stormwater-319	Greene	2002-04		
Show Me Yards-319		2000-03		
Goff Creek	Christian	1995-99	1,507	
Dry Crane Creek	Stone	1995-99	3,323	
Spring Creek	Stone	2001-04		
Crane Creek	Stone	2002-09		
Flat Creek	Barry	2004-11		

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

Web links

US Geological Survey <http://mo.water.usgs.gov/>